RESEARCH SUMMARIES FOR MONTANA WHEAT AND BARLEY COMMITTEE – FUNDED PROJECTS FOR FISCAL YEAR 2009

Title: **Evaluation of various materials and practices contributing toward economic crop production under flexible, continuous and other cropping systems in Montana**

Personnel: Research faculty members at the following Research Centers:

1. Central Agriculture Research Center (CARC)
2. Eastern Agricultural Research Center (EARC)
3. Northern Agricultural Research Center (NARC)
4. Northwestern Agricultural Research Center (NWARC)
5. Southern Agricultural Research Center (SARC)
6. Western Triangle Research Center (WTARC)

Amount Funded: $108,000

Objectives:

1) To evaluate the effects of differing systems on crop and variety performance under diverse environments represented across the Montana Agricultural Experiment Station – Research Center network.

2) To Evaluate the potential fit of other materials, concepts and techniques with various cropping systems employed.

Title: **Critical Infrastructure at Wheat and Barley Research Facilities**

Personnel: Jeff Jacobson, Dean, College of Agriculture, Director, Montana Agricultural Experiment Station; Mal Westcott, Department Head, Department of Research Centers; Jim Squires, farmer, former MWBC and EARC Advisory Committee member

Amount Funded: $100,000

Objectives: to improve and create quality research facilities

Title: **Host Plant Resistance, Tritrophic Pest Interactions, and Cropping Systems for IPM of Wheat Stem Sawfly**

Personnel: David Weaver (PI) Department of Land Resources and Environmental Sciences, Montana State University
http://landresources.montana.edu/Department/Weaver/html

Kevin Delaney, Postdoctoral Associate, Department of Land Resources and Environmental Sciences

Megan Hofland, Research Associate, Department of Land Resources and Environmental Sciences

Norma Irish, Research Associate, Department of Land Resources and Environmental Sciences

Jenny Marquez, Research Associate, Department of Land Resources and Environmental Sciences

Amount Funded: $100,000

Objectives: Overall, to meet ongoing commitments on projects with the cooperators listed above by providing funds to match 50% of the overall costs to this program. Specifically, to provide:

1) Technical expertise and undergraduate labor to support cropping systems research. The project investigates agronomic practices to ascertain best management practices for planting hollow and solid stem wheat varieties under heavy sawfly pressure.

2) Technical field and laboratory expertise and undergraduate labor to support trap crop development using hollow and solid stem spring wheat. The project includes detailed laboratory exploration of factors that influence attractiveness of the crops.

3) Technical support and undergraduate labor to support a project aimed at developing consistent producer recommendations for wheat crops that are challenged by fungal pathogens, grassy weed species, and by the wheat stem sawfly.

4) Research capacity to continue to develop new host plant resistance. Specific areas of focus will be compensatory of tolerance mechanisms for wheat stem sawfly feedings in currently grown hollow and solid stem cultivars. Host plant resistance compounds, including phenolics and terpenoids, will be assayed and screened. Plant physiological responses, such as light and dark photosynthesis reactions and stomatal closure will be explored. Ideally, the target will be to have a variety that killed most sawfly immatures, and did not suffer yield loss due to feeding (tolerance)

Title: **Winter Wheat Breeding/Genetics**

Personnel: Phil Bruckner, Winter Wheat Breeder, PSPP Dep., Bozeman
Jim Berg, Research Associate, PSPP Dep., Bozeman
Ron Ramsfield, Agr. Res. Spec III, PSPP Dep., Bozeman
Petrea Hofer, Research Associate, PSPP Dep., Bozeman

Amount Funded: $70,000

Objectives:

1) Develop improved cultivars of winter wheat adapted to Montana climatic conditions and cropping systems, which possess superior on-farm production characteristics (grain yield, winter hardiness, adequate and durable pest resistance, stress tolerance, agronomic characteristics) and superior enc-use quality characteristics.

2) Isolate, as much as possible, our foreign wheat customers from variations in wheat quality performance by development and release of suitable cultivars and production research to

develop strategies to maximize quality consistency for wheat produced in Montana.

3) Investigate environmental, genetic, and management factors which influence wheat productivity and end-use in Montana including 2008 project: field verification of molecular markers for backcross transfer of stem solidness into elite lines.

4) Coordinate Montana statewide winter wheat variety testing program and provide long-term performance data necessary for cultivar release decisions, variety recommendations, and producer management decisions.

Title: **Spring Wheat Breeding and Genetics**

Personnel: Luther Talbert (Plant Sciences and Plant Pathology), Susan Lanning, Nancy Blake

Amount Funded: $70,000

Objectives:

1) Develop spring wheat varieties for Montana farmers

2) Coordinate the variety testing program for spring wheat

3) Conduct applied research related to genetic improvement for spring wheat

Title: **Development and Deployment of Improved Barley Varieties for Montana Small Grain Producers**

Personnel: Dr. Tom Blake, Plant Sciences and Pathology

Amount Funded: $50,000

Objectives:

1) Complete the process of commercializing the new malting barley varieties 'Hockett' and 'Geraldine'

2) Initiate plant scale testing of MT010158 with

Miller Brewing Company

3) Expand statewide evaluation of the best performing barley lines from the USDA Barley CAP program

4) Expand evaluation of high-yield barley lines carrying the high grain starch allele at *qGPC6H*

5) Continue exploration of barley germplasm and straw degradation technology to expedite development of barley varieties with straw-to-ethanol potential

6) Initiate expanded winter barley evaluation

Title: **Marker Assisted Breeding in Spring and Winter Wheat**

Personnel: Jamie D. Sherman
Assistant Research Professor
Department of Plant Sciences

Amount Funded: $40,000

Objectives:

1) Develop white-seeded wheat through the conversion of high performing red lines using newly identified markers for white genes.

2) Use markers in forward breeding to address emerging problems.

3) Identify new markers for heat tolerance and sawfly attraction.

Title: **Extension Redistribution Supported by Long-Term Monitoring of Wheat Stem Sawfly Parasitoids**

Personnel: David Weaver (PI) Department of Land Resources and Environmental Sciences, Montana State University, http://landresources.montana.edu/Department/Weaver.html

Amount Funded: $33,000

Objectives:

1) To continue a pilot program that is monitoring the population growth of inoculatively established sawfly parasitoids on farms where historically there was sawfly damage in the presence of negligible parasitism. The project is conducted in direct collaboration with selected wheat producers and wheat grower organizations and aims to evaluate the continuing success of these parasitoids at fifteen farms.

2) This year we wish to establish twenty new sites throughout Montana to continue the process of translating parasitoid redistribution and conservation to Montana wheat growers. Therefore, these twenty new sites will be established with input from both County Agents and Grower Organizations. These sites will not be monitored for long-term population dynamics, due to the fact that we are at maximum capacity for long term monitoring.

Title: **Improved Quality of Hard Red and Hard White Wheat**

Personnel: Deanna Nash

Amount Funded: $33,000

Objectives:

1) Evaluate end-use quality of hard red and hard white lines developed by MSU spring and winter wheat breeding programs.

2) Showcase Montana's newest varietal releases for visiting Trade Teams as they tour the Cereal Quality Lab (CQL) testing facilities.

3) Participate in the milling and baking contests for the Central Montana Fair and the Choteau County Fair.

4) Promote Montana wheat quality by conducting

tours and hands-on demonstrations.

5) Participate in research projects designed to determine ways to improve end-use quality parameters of new wheat varieties by cooperating with Montana Agricultural Experiment Station (MAES) researchers, the general public and industry.

Title: **Orange Wheat Blossom Midge Management**

Personnel: Bob Stougaard: agronomist, Northwestern Ag Research Center
Qingwu Xue: agronomist, Northwestern Ag Research Center
David Weaver; entomologist, LRES, Bozeman
Luther Talbert: spring wheat breeder, PSPP Bozeman

Amount Funded: **$21,913**

Objectives:

1) Validate a degree-day model for the Montana population

2) Screen spring wheat varieties for midge resistance

3) Introduce biological control agents from North Dakota

4) Monitor potential midge populations in Triangle counties

Title: **Susceptibility of Great Plains wheat varieties and weeds to *Wheat streak mosaic virus***

Personnel: Dr. Mary Burrows, Assistant Professor and PI, Dai Ito, graduate student, and Ken Baker, research assistant, PSPP, Montana State University.

Objectives:

1) Evaluate widely planted winter and spring

wheat varieties in Montana for susceptibility of *wheat streak mosaic virus.*

2) Evaluate wheat varieties and weed biotypes from the Great Plains region for susceptibility to *wheat streak mosaic virus.*

3) Disseminate the results of this study to growers in Montana and throughout the Great Plains region.

Title: **Dryland cropping systems: 1) diversified high and low input strategies; 2) residual soil herbicide effects on 12 crops; and 3) agronomic factors for sawfly management.**

Personnel: Perry Miller (P.I.), Jeff Holmes (field operations), Clain Jones (soil nutrient dynamics), rick Engel (nitrous oxide emissions), Dave Buschena (economic assessment); Fabian Menalled (herbicides); and David Weaver (sawfly).

Amount Funded: $19,741

Objectives:

1) Crop Diversity Rotation Study (CDRS): Compare diversified no-till and organic cropping systems, including low and high input strategies, for crop productivity and quality, resource use efficiency, and weed population characteristics. [and soil nutrient status measured independently by Clain Jones]

2) Greenhouse Gas Rotation Study (GGRS): Compare low and high N fertilizer levels within and among a series of tilled, no-till, and organic wheat only and wheat – pea cropping systems for crop productivity and quality, resource use efficiency, and cropping system energy budgets. [and greenhouse gas effects, funded independently by Rick Engel]

3) Quality crop yield loss due to residual soil herbicides in a favorable environment.

4) Quantify the effects of wheat management (field environment, wheat type, variety, row spacing, and seeding rate) on wheat productivity and quality. [and relate wheat agronomy to sawfly-induced yield losses and parasitoid interactions, funded independently by David Weaver

Title: **Distribution and severity of root disease in Montana's wheat**

Personnel: Alan T. Dyer, Jeffery Johnston

Amount Funded: $15,000

Objectives:

1) Apply real-time PCR to determine the distribution and severity of Fusarium crown rot and common root rot within Montana.

2) Evaluate tolerance and performance of top wheat cultivars to Fusarium crown rot, common root rot and Cephalosporium stripe.

Title: **Enhanced field selection for wheat stem sawfly resistance**

Personnel: Phil Bruckner, PSPP Dep., Bozeman
Gregg Carlson, Northern Agr. Res. Ctr., Havre
Luther Talbert, PSPP Dep., Bozeman
Jim Berg, PSPP Dep., Bozeman
Peggy Lamb, Northern Agr. Res. Ctr., Havre

Amount Funded: $15,000

Objectives:

1) Subject early-generation segregation winter wheat bulk populations and derived lines to heavy selection pressure for wheat stem sawfly (WSS) resistance and selected plant phenotypes resistant to WSS infestation and cutting damage.

2) Evaluate spring and winter wheat cultivars and

advanced lines for resistance to infestation and cutting damage by WSS and for yield performance under heavy infestation by WSS.

3) Systematically evaluate selected germplasm for enhanced stem solidness and alternative sources of WSS resistance.

4) Provide field sites, representative of sawfly-infested production regions, for research and demonstration to producers of effective sawfly management strategies and including use of resistant cultivars.

Title: **Molecular genetics of wheat stem sawfly odor receptors to enhance IPM based on chemical ecology.**

Personnel:

1) PI, Kevin W. Wanner, Assistant Professor of Entomology & Extension, Department of Plant Sciences and Plant Pathology, Montana State University. (current webpage http://www.life.uiuc.edu/robertson/personnel/kevin.html)

2) Co-PI, David Weaver, Associate Professor of Entomology, Department of Land Resources and Environmental Sciences, Montana State University. (http://landresources.montana.edu/Department/Weaver.html)

Amount Funded: $11,500

Objectives:

1) Study the molecular mechanisms of odor reception in the wheat and stem sawfly. Specifically, identify the receptor genes in sawfly antennae that detect host plant odors.

2) Obtain preliminary data to support a USDA, CSREES, NRI grant application for 2008-2009. The proposal will target strategic exploitation of wheat stem sawfly odor receptors to develop new IPM tools.

Title: **Response of Spring Wheat with and without "Stay-Green" Trait to Nitrogen Fertilizer under irrigated and Dryland conditions**

Personnel: Chengci Chen, Assistant Professor of Cropping systems, Central Ag. Research Center
Mal Westcott, Professor of Soil Fertility, Western Triangle Ag. Research Center
Grant Jackman, Professor of Soil Fertility, Western Triangle Ag. Research Center
Jeff Whitmus, Research Assistant, Northern Ag. Research Center

Amount Funded: $11,261

Objectives: **The objectives of this study are:**

1) To investigate the different yield responses of spring wheat cultivars with an without "stay-green" trait to nitrogen fertilizer under irrigated and dryland conditions; and

2) to investigate retranslocation of soluble carbohydrates and proteins from leaves and stems of "stay –green" and non "stay-green" cultivars to grains under irrigated and dryland conditions.

Title: **Early generation durum selection and germplasm Improvement**

Personnel: Joyce Eckhoff
Debbie Kunda
MSU Eastern Ag. Research Center, 1501 N Central Ave., Sidney, MT 59270
Phone: (406) 433-2208
e-mail: jeckhoff@sidney.ars.usda.gov

Amount Funded: $10,000

Objectives: **-** To produce improved durum germplasm for development of varieties for Montana producers

- To develop value-added characteristics in durum for manufacture of specialty producers

Title: **Impact of Polyphenol Oxidase Genes on Agronomic and Quality Traits in Winter Wheat**

Personnel: Jack Martin, Professor, Dept. of Plant Sciences and Plant Pathology
Phil Bruckner, Professor, Dept. of Plant Sciences and Plant Pathology

Amount Funded: $10,000

Objectives:

1) Determine the effects of two major genes controlling Polyphenol oxidase activity on agronomic traits in a segregating winter wheat populations.

2) Determine the effects of two major genes controlling Polyphenol oxidase activity on noodle and bread quality in a segregating winter wheat population.

Title: **Characterization and transfer of new rust resistance genes**

Personnel: Li Huang

Amount Funded: $10,000

Objectives:

1) Evaluate leaf and stem rust resistance genes in several breeding lines.

2) Develop mapping populations to genetically map the rust resistance genes.

3) Transfer different rust resistance genes in Montana elite spring wheat varieties.

4) Evaluate leaf and stem rust resistance for wheat breeding programs in the department of PSPP

Title: **Continuing as an Underwriter for MONTANA AG LIVE!**

Personnel: Jack Riesselman

Amount Funded: $3,500

Objectives:

1) The committee will receive significant public exposure at modest cost. Underwriters are listed monthly in the KUSM program guide, which is received by the 5,500 members of Montana Public Television. In addition, underwriters receive on-air credits during each of the 67 weekly programs.

2) The committee will help to provide grain producers and agricultural businesses with timely and relevant answers to their questions in a cost-effective manner.

3) The committee will help interpret the day-to-day issues facing ag producers to nonag audiences. Given the growing tensions in some sectors of Montana between producers and nonproducers, a forum such as MONTANA AG LIVE!, where the needs of farmers are clarified and addressed, offers a rational atmosphere for increased public awareness.